Metropolitan Museum of Art
Gas Chromatography- Mass Spectrometry (GC-MS) Results from Material Analysis

This document includes (1) a mass spectrum and (2) the volatile organic compounds (VOCs) emitted from samples using GC-MS analysis. The data is not interpreted; however, several classes of chemicals are highlighted because they are potential risks for artwork in an enclosed environment. A basic key, provided below, indicates those classes. The amount of each chemical identified has not been determined; similarly, it is not known how much of each chemical is necessary to do damage to art. Finally, peaks may be present that are the result of the sample adsorbing chemicals from the air and reemitting them during testing rather than being inherent to the sample. Research is ongoing to determine specifically which chemicals and amounts are required to negatively affect artifacts.

Highlighted data:

Pink – chemicals currently known to be hazardous to art

Green – amines; can raise the pH, are suspected to react with acids and may form crystals in an enclosed environment

Yellow – chemicals of the following type, which *may* be hazardous to art:

Acids – lower the pH, corrosive to metals, degrade organic materials

Aldehydes – can convert to acids with heat or exposure to UV light

Esters – can hydrolyze into acids with heat and humidity

Sulfur-containing compounds – known to tarnish and corrode some metals

Halogenated compounds – can become reactive with exposure to heat and UV light

Nitrogen-containing, not amine – can react with other off-gassed chemicals

Alkynes – can become reactive when exposed to heat or UV light

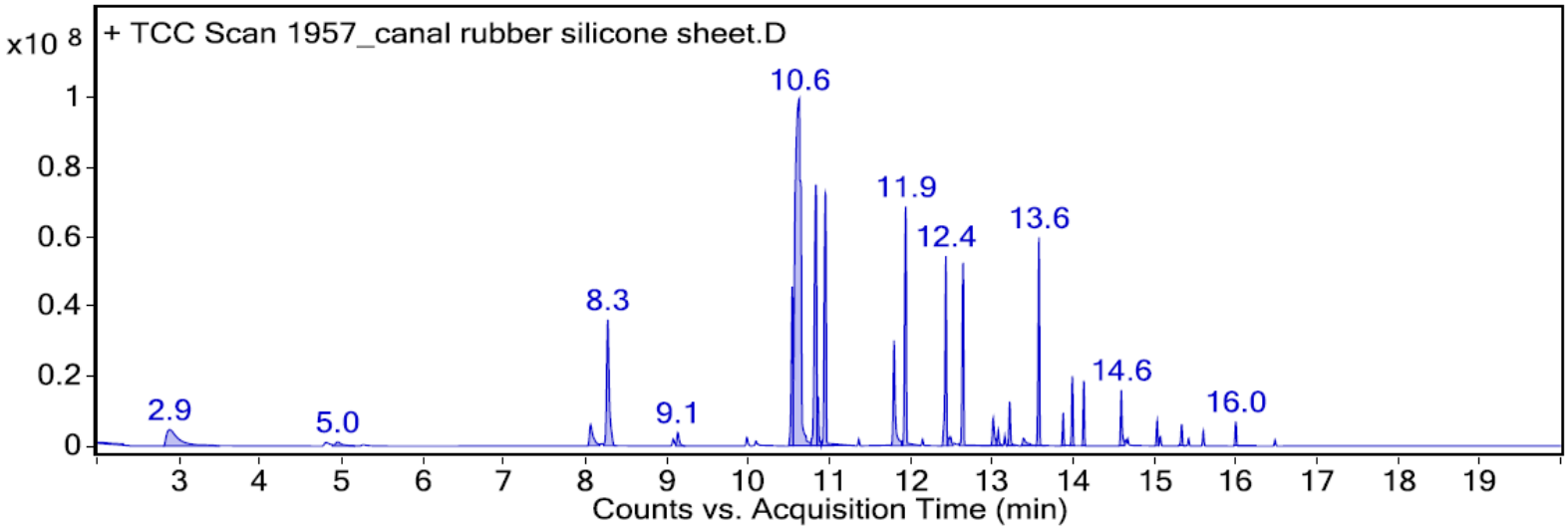
Sample: Canal Rubber 1/32" translucent food grade silicone sheet

Oddy test result: Permanent

Date GC-MS collected: 09/20/2017

Technique used: SPME Arrow with a PDMS/DVB fiber; Agilent 7890B GC and 5977B MS fitted with a GL Sciences OPTIC-4 multimode inlet and LEAP PAL RTC autosampler; Pre-heated sample at 60°C for 20 minutes; fiber exposure to sample at 60°C for 20 minutes; fiber injected into 220°C inlet and cryotrapped for 2 min at -15°C; GC ramped from 40°C to 225 °C at 10°C/min. Data analyzed in Masshunter Qualitative. Samples > 80% match with a NIST library are reported.

VOCs not highlighted are because they were also observed in blanks: (1) ~13.0 min: 2-methyl-, 2,2-dimethyl-1-(2-hydroxyl-1-methylethyl) propyl ester propanoic acid; (2) ~13.2 min: 2-methyl-, 3-hydroxyl-2,4,4-trimethylpentyl ester propanoic acid



2.100	93.7	C3H10OSi	90.1	4361705	1066-40-6	Silanol, trimethyl-
2.900	94.5	C4H8	56.1	20639038	115-11-7	1-Propene, 2-methyl-
5.000	95.8	C7H18OSi	146.1	3735577	1825-65-6	Silane, butoxytrimethyl-
5.300	94.5	C6H18O3Si3	222.1	2099740	541-05-9	Cyclotrisiloxane, hexamethyl-
9.100	98.4	C10H16	136.1	3999604	138-86-3	dl-Limonene
9.100	94.3	C10H30O3Si4	310.1	6635108	17928-28-8	Methyltris(trimethylsiloxy)silane
10.000	96.5	C10H22O2	174.2	3700858	871-22-7	Butane, 1,1'-[ethylidenebis(oxy)]bis-
10.100	95.3	C11H24	156.2	2462676	1120-21-4	Undecane
10.500	95.2	C10H30O5Si5	370.1	35626533	541-02-6	Cyclopentasiloxane, decamethyl-
10.600	94.5	C18H18O4	298.1	54066204	105314-85-0	3,7-dimethoxy-11a-methylpterocarpan
10.900	92.8	C10H30O5Si5	370.1	10945520	541-02-6	Cyclopentasiloxane, decamethyl-
11.000	94.6	C12H36O4Si5	384.1	116473687	141-63-9	Pentasiloxane, dodecamethyl-
11.400	96.3	C12H26	170.2	2113523	112-40-3	Dodecane
11.800	86.3	C10H30O5Si5	370.1	50677060	541-02-6	Cyclopentasiloxane, decamethyl-
12.200	95.2	C12H36O6Si6	444.1	1925141	540-97-6	Cyclohexasiloxane, dodecamethyl-
12.400	80.5	C16H11NO2S	281.1	5809931	70453-75-7	2-methoxy[1]benzothieno[2,3-c]quinolin-6(5H)-one
12.400	95.7	C12H36O6Si6	444.1	67192327	540-97-6	Cyclohexasiloxane, dodecamethyl-
13.000	90.8	C12H24O3	216.2	15541265	74367-33-2	Propanoic acid, 2-methyl-, 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester
13.200	93.6	C12H24O3	216.2	16912493	77-68-9	Propanoic acid, 2-methyl-, 3-hydroxy-2,2,4-trimethylpentyl ester
14.000	82.0	C14H42O7Si7	518.1	22078802	107-50-6	Cycloheptasiloxane, tetradecamethyl-
15.100	84.5	C16H30O4	286.2	2317617	74381-40-1	Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester
15.300	87.6	C16H48O8Si8	592.2	7428349	556-68-3	Cyclooctasiloxane, hexadecamethyl-
16.500	85.0	C18H54O9Si9	666.2	1924665	556-71-8	OCTADECAMETHYLCYCLONONASILOXANE